PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

PLANTERS' BULLETIN FORTY-SIX

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R R I

LOCATION. The Institute's laboratories and offices at the third mile, Ampang Road, Kuala Lumpur are open from 8 am to 1 pm and 2 pm to 4 pm on Mondays to Fridays, and from 8 am to 12.30 pm on Saturdays.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement. There is a guest house.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special enquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 72051. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and advice of despatch should be given by letter or telegram.

PROHIBITED PLANT SPECIMENS. Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on any matter that may require examination of living material must first enquire by letter.

ADVICE. Enquiries are invited from rubber producers in the Federation of Malaya, Singapore, the colony of North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of our clone indentification inspectors. INTERVIEWS should be arranged by letter, as members of the senior research and advisory staff are frequently absent on visits to plantations.

PUBLICATIONS. Subscription to all or any of our series of publications (*Planters' Bulletin, Journal, Reports*, and miscellaneous booklets) may be made by depositing $15 with us. An annual statement of account will then be submitted. We are unable to give annual subscription rates or any form of discount, but for multiple subscriptions a lower rate of initial deposit is acceptable. Postage is charged on oversea mailings. A list of 'Publications of the RRI' is available on request.

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur January 1960 Number 46

Editorial: The Estates Advisory Service

When the Rubber Research Institute of Malaya was founded in 1925 its tasks were defined as 'research into and investigation of all problems and matters relating to rubber and the provision of information relating to the same'. Thus the importance of advice to estates was recognised from the beginning. In 1927-8 the R.R.I.M. established a Field Division of four advisory officers, but the economy measures which the industry was forced to adopt in the depression years led to the dissolution of the Field Division in 1931; advice to the planter was made the responsibility of the research divisions of the Institute. Since then, and especially since 1946, the increasing volume of advisory work has inevitably encroached on time allotted to research. Although advice given by the most senior research officers has always been widely appreciated, it became evident in the 1950's that under the prevailing system no great advance in the scope of advisory work could be expected – except at the expense of research. We now recognise that these difficulties can only be solved by the formation of a separate advisory service for estates, on the lines of the Smallholders' Advisory Service which we established in 1934.

1958. RE-FORMATION

The Blackman Committee Report of 1957 recommended that the Institute should establish a special advisory service whose members would be unhampered by the demands of research. A new Estates Advisory Service has therefore been set up to deal with advice on all aspects of *Hevea* cultivation and crop-production, formerly handled by the Soils, Botanical and Pathological Divisions. The new service has already taken over the advisory work of the Soils Division and will take over that of the remaining two divisions as soon as experienced staff are recruited. The already-existing Chemical Division Advisory Service, which deals with the collection and factory processing of the crop, will also be expanded.

What advantages are to be gained from a separately constituted Estates Advisory Service? *First,* the research worker will be relieved of routine enquiries which can most efficiently be conducted by full-time advisory officers. New problems which may arise will, of course, be referred by these officers to the specialist research workers concerned. *Second,* there will be economy of effort. One advisory officer can deal with several problems on a single estate. He can also make systematic

tours of the country, since, unlike the research officer, he has no experimental work to attend to. *Third,* advice can be integrated more easily. Sometimes in the past, two or more divisions co-operated in solving one problem and it was even possible for conflict of opinion to arise over the correct solution! Dieback in cover plants, for example, may be caused by nutrient deficiency (Soils Division) or fungus diseases (Pathological Division); a full-time advisory officer can co-ordinate the opinions of the divisions concerned and add his own practical experience for good measure. *Finally,* the new service will be 'aggressive' rather than 'passive'. It will not merely 'wait to be asked' but will seek to bring useful knowledge to the planter's notice and to make contact with estates which have previously had few dealings with the R.R.I.M.

1960. FOLLOW-THROUGH

What are the plans which we hope to set in motion in 1960? A full-time advisory staff of six officers will be recruited and we shall strive to improve the service already given. In the past research workers giving advice have often lacked the time to follow up their recommendations with visits to estates and they have had even less opportunity to make country-wide surveys of the occurrence of important problems. Both defects of the old system can be remedied. In the long run, extensive observations of estate practices and difficulties may well prove the most important new development; the records will be analysed and the most pressing problems brought to the attention of the research divisions.

As it is intended to include studies of the economics of rubber production in the Institute's research programme, it will no doubt be possible in the future to give advice on this important subject. In recent years both state and commercial organisations in the more developed countries have made rapid progress in this field. With co-operation between the R.R.I.M. and the estate-owning companies similar progress can be achieved in Malaya, where means of reducing costs of production and increasing the daily output per man need special attention.

It is planned to go ahead immediately with the extension of advice to the growing number of moderate-sized, generally Asian-owned, estates. A detailed survey has already shown that such estates, sometimes badly in need of advice, are often completely out of touch with the results of our research. A Chinese version of *Planters' Bulletin,* to be published in the second half of 1960, will assist our advisory officers in this sector of their work.

To sum up, it is planned to increase the dissemination of useful information in every way. The consequences of advice will be studied in greater detail, more estates will be visited, more records made of current problems. Publications of practical value will aid the adviser in his work and some ideas which proved useful in the past, radio talks

and planters' conferences for example, might be revived. At this early stage it would be unwise to dwell on future achievements — painters of rosy pictures often enjoy short-lived popularity. It is nevertheless safe to say that the new service will expand the volume of advice and make every effort to improve its quality.

Secondary Leaf Fall and South American Leaf Blight

EACH JANUARY, DURING THE TWELVE YEARS 1948-1959, we have circularised managers of estates asking for specimens of secondary leaf fall to be sent to us, with particulars of the planting from which they come — the area affected, age of the trees, type of planting material — and an estimate of the severity of the leaf fall. Specimens from smallholdings have been collected by officers of our Smallholders' Advisory Service. This procedure had its origin in pre-war Agricultural Pests Enactments, which made *Oidium* a notifiable disease. Specimens were sent to us for diagnosis.

DISCONTINUATION OF THE ANNUAL CIRCULAR

In the current Agricultural Pests Ordinance, enacted in 1953, the only notifiable disease of rubber is South American leaf blight, caused by the fungus *Dothidella ulei,* which is scheduled as a dangerous pest. Although the original purpose of our examining secondary leaf fall specimens no longer applied after 1953, we maintained the annual circular to estates for three reasons. Firstly, it enabled us to keep a check on the extent and severity of the leaf fall; secondly, the accumulated records might show exceptional susceptibility or resistance among the different types of planting material; thirdly, the returns were a safeguard against *Dothidella* becoming established, unnoticed, in this country. The circulars to estates are now being discontinued, for it is felt that the first two requirements have already been adequately fulfilled, while the third can better be met in another way.

INTERPRETATION OF RETURNS

The returns from our annual circular have been analysed and statements on the course of secondary leaf fall throughout the country have been given in our Annual Reports. It reaches a peak in the months of March or April, during the refoliation which follows the main wintering period of the year. Climatic factors determine the timing and severity of attack of the four parasites concerned — the fungi *Oidium heveae* and *Gloeosporium alborubrum,* the mite *Hemitarsonemus latus* and the thrips *Sericothrips* (previously called *Scirtothrips*) *dorsalis*. A description

Dothidella ulei

A_1 A_2

Comparison of South American leaf blight with three common leaf diseases

We illustrate the two stages of South American leaf blight — the primary stage (A1) on young leaves and the secondary stage (A2) on a mature leaflet. For comparison are shown: Gloeosporium *leaf disease on young (B1) and mature (B2) leaflets;* Oidium *on a young leaflet (C1) (the form in which it appears as secondary leaf fall, along with B1) and also in the form of powdery mildew (C2) occurring on seedlings growing under shade;* Helminthosporium heveae, *primarily a nursery disease, on an immature leaflet (D1) and on a mature leaflet (D2), on which the typical bird's eye spots appear.*

Gloeosporium heveae

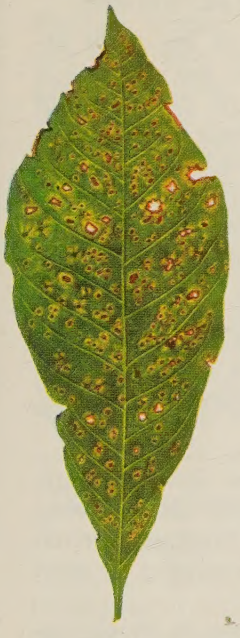
B_1

Oidium heveae

C_1

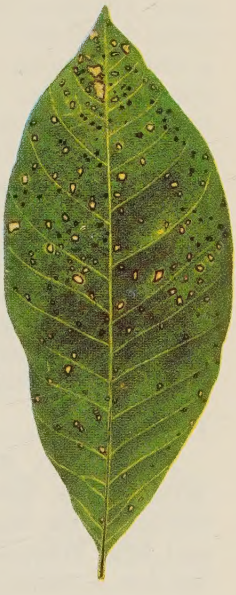
Helminthosporium heveae

D_1

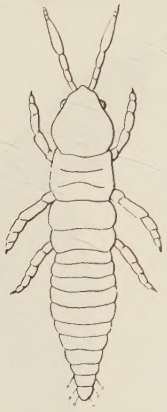


B_2

C_2



D_2



First stage nymph of Sericothrips dorsalis, × 100. *The adult would be more than twice as large.*

Adult female of the mite Hemitarsonemus latus, × 125.

of the leaf fall and of the causal agents was given in an article in *Planters' Bulletin 27,** November 1956, with notes on predisposing factors and differences in the susceptibility of various types of planting material.

Although general impressions can be formed from the records which we have accumulated, we have to be cautious in attempting to arrive at conclusions on points of detail. It has to be borne in mind that the specimens are not obtained by methodical sampling, but at the discretion of the sender. Though old unselected seedling trees are evidently less affected by *Gloeosporium,* differences in the susceptibility of clones do not emerge clearly. The central fact is that secondary leaf fall in Malaya is not severe enough to call for control measures. Rarely is there more than one fall of injured leaves, nor is it on a scale to set the trees back appreciably.

RECOGNITION AND NOTIFICATION OF SOUTH AMERICAN LEAF BLIGHT

There remains the question of the early recognition of South American leaf blight — a prerequisite for the success of the eradicant campaign which has been drawn up.

Dothidella ulei is still confined to South and Central America. If it were to reach this country, despite the careful measures taken to exclude it, it would be expected to become apparent as a contributory cause of secondary leaf fall, which well might be of exceptional severity. The vigilance of planters at this time is thus the best defence against *Dothidella* being overlooked. We are accordingly taking this opportunity of issuing once again the substance of a leaflet that was enclosed with *Planters' Bulletin 5,* describing and illustrating the disease.

Primary Stage

The primary stage appears on the young pendant leaves as dull, velvety spots, olive to greyish green in colour, usually on the lower surface. If the infection is heavy, the young leaf soon blackens, shrivels and falls. When only a few spots develop, the leaf continues to grow but has a ragged appearance.

Provided the olive green velvety spots are to be seen, it should not be difficult to distinguish South American leaf blight, even at this early

* The drawings of *H. latus* and *S. dorsalis* were incorrectly labelled. The error is corrected in this article.

stage, from the leaf diseases of rubber which already occur in Malaya. Shrivelling and blackening of very young leaves is a symptom common to many leaf diseases.

Secondary Stage

In the secondary stage, which develops on leaves that have survived the primary infection, the disease assumes its most characteristic form, entirely unlike that of any disease now occurring in the Far East. Around the margins of the old spots, innumerable small spherical black bodies develop, mostly on the upper surface of the leaf. First appearing before the leaf is quite full grown, they continue to arise for some time afterwards, and present an aspect that is quite unmistakable. Hard, and projecting from the surface, they make the leaf rough to the touch.

As an aid to recognition we illustrate the two stages that the disease takes; and, for comparison, stages of three common diseases already here — bird's eye spot, *Gloeosporium* leaf disease and *Oidium heveae*. We may mention also another fungus (*Cladosporium herbarum*) which, producing olive green spots on sun-scorched leaves, might be mistaken for *D. ulei*.

Despatch of Specimens

When there is any doubt, specimens should at once be sent to the Institute. Collect a few leaves showing the suspected symptoms, separate them with several thicknesses of newspaper cut into strips about five inches wide, roll them into a compact bundle and put it into a tin which has a tightly fitting lid. Before closing the tin, well moisten the roll of leaves with formalin. Packing and disinfection should be done in the field, to avoid any risk of spores from the infected leaves spreading the disease. Wrap the tin and address it to the Pathological Division of the R.R.I.M., marked 'Suspected S.A.L.B.' to ensure that the specimens receive immediate attention. Until you hear from us, which will be by return post, stop all work in the area and, if possible, prevent anyone entering it.

In view of the serious nature of South American leaf blight, material that is suspect should in no circumstances be sent to us unless it has been disinfected and packed in the manner described.

Demonstration of Root Disease Control

During the current year the Pathological Division will be able to arrange for a Field Assistant to visit estates to instruct root disease gangs in recognising the root parasites, and in controlling root disease by the methods which we advise. Two days will suffice for this purpose. Managers who wish to avail themselves of the service offered are asked to write to the Director, indicating whether accommodation can be provided on the estate.

RRIM 600 Series Clones

THE FIFTH INTERIM REPORT is presented for a further year's tapping in the large scale trials of clones RRIM 600 to 618 and RRIM 619 to 630 at the Rubber Research Institute Experiment Station, the last report having appeared in *Planters' Bulletin 41*, March 1959.

RRIM 600 — 618

There are five plots of a third of an acre for each clone in this trial. The stand during the year under review was 125 trees per acre. The results for the fourth year of tapping, which was completed in September 1959, are shown in Tables 1 and 2.

TABLE 1. LARGE SCALE TRIAL OF CLONES RRIM 600 - 618 AT THE R.R.I. EXPERIMENT STATION

Girth Measurements

Clone	*Mean girth at 60 inches from the union*		*Girth increment in inches October '58 – September '59*	*Wind damage cases in 4th year of tapping*
	In inches in Sept. 1958	*As % of RRIM 501*		
RRIM 600	26.6	114	1.3	–
RRIM 601	26.6	114	0.9	2
RRIM 602	27.2	117	1.4	–
RRIM 603	26.7	115	1.2	1
RRIM 604	26.6	114	1.4	–
RRIM 605	26.0	112	1.6	2
RRIM 606	26.7	115	1.5	1
RRIM 607	26.4	113	0.9	–
RRIM 608	23.6	101	0.7	1
RRIM 609	26.1	112	1.6	–
RRIM 610	24.0	103	0.8	–
RRIM 611	25.1	108	1.1	3
RRIM 612	28.2	121	1.4	–
RRIM 613	23.9	103	0.4	33
RRIM 614	25.6	110	1.3	10
RRIM 615	24.2	104	0.9	–
RRIM 616	24.9	107	1.0	8
RRIM 617	24.8	106	1.1	–
RRIM 618	22.8	98	0.7	–
Tjir 1	26.9	115	1.2	1
RRIM 501	23.3	100	0.7	2
Mean	25.5	109	1.1	

Girth — The mean increment during the fourth year of tapping was 1.1 inches. The increment varied from 0.7 inches for RRIM 501 to 1.6 inches for RRIM 605.

Yield — The yields in pounds per acre per year and in grams per tree per tapping are given in Table 2, together with the average yields over the four years of tapping.

TABLE 2. LARGE SCALE TRIAL OF CLONES RRIM 600–618 AT THE R.R.I. EXPERIMENT STATION

Yield

Clone	*Parentage*	*Mean yield in fourth year of tapping*				*Mean yield over four years of tapping*				*Dry trees in 4th year of tapping*
		Per tree per tapping		*Per acre per annum*		*Per tree per tapping*		*Per acre per annum*		
		Grams	*As % of RRIM 501*	*lb*	*As % of RRIM 501*	*Grams*	*As % of RRIM 501*	*lb*	*As % of RRIM 501*	
RRIM 600	Tjir 1 × PB 86	47.2	114	2135	117	33.1	103	1309	112	1
RRIM 601	Tjir 1 × Gl 1	36.9	89	1631	89	25.2	79	1021	87	4
RRIM 602	Tjir 1 × Gl 1	31.1	75	1411	77	21.8	68	904	77	1
RRIM 603	PB 86 × Pil B84	35.2	85	1481	81	29.2	91	1122	96	4
RRIM 604	Tjir 1 × PB 49	30.1	73	1360	74	24.7	77	899	77	3
RRIM 605	Tjir 1 × PB 49	40.5	98	1846	101	33.3	104	1323	113	–
RRIM 606	Tjir 1 × PB 49	35.2	85	1621	89	26.7	83	1083	92	1
RRIM 607	Tjir 1 × PB 49	33.2	80	1526	83	26.3	82	1059	90	–
RRIM 608	AVROS 33 × Tjir 1	27.3	66	1150	63	21.1	66	706	60	–
RRIM 609	AVROS 157 × BD 5	33.5	81	1514	83	26.8	83	928	79	2
RRIM 610	RRIM 504 × Tjir 1	32.6	79	1460	80	28.5	89	1049	89	–
RRIM 611	RRIM 504 × Tjir 1	30.1	73	1360	74	24.2	75	916	78	–
RRIM 612	AVROS 157 × PB 49	27.7	67	1256	69	18.3	57	764	65	1
RRIM 613	Tjir 1 × RRIM 509	55.0	133	1187	65	42.0	131	1316	112	5
RRIM 614	Tjir 1 × RRIM 509	58.0	140	1597	87	45.8	143	1431	122	2
RRIM 615	RRIM 511 × Tjir 1	26.0	62	1156	63	17.8	55	677	58	–
RRIM 616	Tjir 1 × RRIM 507	47.4	114	1816	99	33.3	104	1166	99	2
RRIM 617	BR 2 × RRIM 500	30.3	73	1350	74	25.0	78	842	72	–
RRIM 618	Lun N × RRIM 501	27.3	66	1156	63	23.2	72	748	64	–
Tjir 1		31.9	77	1389	76	23.0	72	876	75	–
RRIM 501	Pil A44 × Lun N	41.4	100	1829	100	32.1	100	1174	100	3
Mean		36.1	86	1487	81	27.7	86	1015	86	

The yield of clone RRIM 501 has increased from 1427 lb per acre in the third year to 1829 lb per acre in the fourth year. Yield of RRIM 600 has increased from 98% of RRIM 501 to 117%. No substantial changes have occurred in the relative yield of the other promising clones.

The decrease in yield of clone RRIM 610 after a high yield in the first tapping year has been confirmed in other trials; as the growth of this clone is usually below average and the foliage is often poor, the clone is at present removed from the list of most promising clones (see *Amendments to Planting Recommendations 1959-60*, page 13 of this issue).

Bark Renewal — No measurements were taken this year. The plots of clone RRIM 600 contain rather a high proportion of trees which have markedly bulging panels above the tapping cut. These panels may be difficult to tap without wounding on bark of first renewal, although the renewed bark is above average in thickness.

Wind Damage — Apart from clones RRIM 613, 614 and 616 no serious wind damage was experienced. The troublesome bending of immature trees of RRIM 603 and the risk of breakage of mature trees has led to the removal of this clone from the list of most promising clones.

Dry Rubber Content — Latex samples were analysed by Chemical Division in August 1959. Clone RRIM 605 had the highest d.r.c. (42.6%).

Brown Bast — The number of dry trees at the end of the fourth year of tapping is given in Table 2.

RRIM 619 — 630

There are four plots of one third of an acre of each clone in this trial. RRIM 501 is the control. Results for the third year of tapping, which was completed in June 1959, are given in Tables 3 and 4. The mean stand at the beginning of this tapping year was 130 trees per acre. In January 1959 the stand was reduced to 123 trees per acre. Ninety-seven per cent of the trees were in tapping.

Girth — The mean girth increment during the third year of tapping was 1.1 inches. RRIM 623 had the highest increment, RRIM 501 and 628 the lowest. The mean girth of RRIM 623 is now 18% more than that of RRIM 501.

Yield — The highest yielders in the third year of tapping were RRIM 628, 621 and 623. Clone RRIM 628 has yielded 42% more than RRIM 501 over the three tapping years. Since it also appears to be an outstanding yielder in other trials we have added this clone to the list of promising clones.

Bark Thickness — The thickness of the three years' renewed bark of RRIM 501 is only 85% of the mean for the trial. The renewed bark of RRIM 623 and 628 is of average thickness.

TABLE 3. LARGE SCALE TRIAL OF CLONES RRIM 619 - 630 AT THE R.R.I. EXPERIMENT STATION

Girth and bark thickness

Clone	Mean girth at 60 inches from the union		Girth increment in inches '58–'59	Bark thickness in June 1959				Wind damage cases in 3rd year of tapping
	In inches in June 1959	As % of RRIM 501		Virgin bark in mm	As % of RRIM 501	Renewed bark 3rd year in mm	As % of RRIM 501	
RRIM 619	23.8	106	1.2	7.6	109	5.3	115	5
RRIM 620	24.1	108	1.3	7.6	109	5.5	120	–
RRIM 621	24.4	109	1.2	7.9	113	5.6	122	2
RRIM 622	23.2	104	1.1	6.8	97	5.4	117	–
RRIM 623	26.4	118	1.5	6.7	96	5.2	113	–
RRIM 624	21.3	95	0.9	6.8	97	5.0	109	–
RRIM 625	26.0	116	1.4	6.5	93	5.2	113	–
RRIM 626	22.2	99	0.9	8.4	120	5.9	128	1
RRIM 627	24.3	108	1.2	6.1	87	4.8	104	–
RRIM 628	22.3	100	0.8	7.6	109	5.4	117	–
RRIM 629	22.3	100	1.2	7.0	100	5.6	122	–
RRIM 630	22.1	99	1.0	8.1	116	6.3	137	–
RRIM 501	22.4	100	0.8	7.0	100	4.6	100	2
Mean	23.4	104	1.1	7.2	103	5.4	117	

TABLE 4. LARGE SCALE TRIAL OF CLONES RRIM 619–630 AT THE R.R.I. EXPERIMENT STATION

Yield

Clone	*Parentage*	*Mean yield in third year of tapping*				*Mean yield over three years of tapping*				*Dry trees in 3rd year of tapping*
		Per tree per tapping		*Per acre per annum*		*Per tree per tapping*		*Per acre per annum*		
		Grams	*As % of RRIM 501*	*lb*	*As % of RRIM 501*	*Grams*	*As % of RRIM 501*	*lb*	*As % of RRIM 501*	
RRIM 619	RRIM 501 × Tjir 1	32.9	82	1347	76	23.4	78	920	78	5
RRIM 620	RRIM 501 × RRIM 511	35.5	89	1594	90	25.6	86	1093	93	–
RRIM 621	RRIM 504 × Tjir 1	43.4	108	2027	115	31.3	105	1482	126	3
RRIM 622	Tjir 1 × Pil B84	27.0	68	1133	64	22.7	76	827	70	1
RRIM 623	PB 49 × Pil B84	41.6	104	1925	109	32.3	108	1556	132	2
RRIM 624	Tjir 1 × RRIM 529	33.0	82	1172	66	30.9	104	849	72	4
RRIM 625	Tjir 1 × RRIM 526	31.3	78	1446	82	25.0	84	1155	98	3
RRIM 626	Tjir 1 × RRIM 500	43.4	108	1963	111	34.3	115	1175	100	4
RRIM 627	Tjir 1 × RRIM 526	31.8	80	1458	83	24.3	82	1063	90	2
RRIM 628	Tjir 1 × RRIM 527	53.3	133	2362	134	42.9	144	1671	142	5
RRIM 629	Tjir 1 × RRIM 529	31.6	80	1316	74	25.0	84	855	73	2
RRIM 630	Tjir 1 × RRIM 527	34.0	85	1474	83	25.9	87	907	77	2
RRIM 501	Pil A44 × Lun N	40.0	100	1767	100	29.8	100	1178	100	3
Mean		36.8	92	1614	91	28.7	96	1133	96	

Wind Damage — Five more cases of wind damage occurred in the plots of RRIM 619 during the year under review. As was mentioned in an earlier report, RRIM 621 and 626 have proved to be very susceptible to wind damage in Estate trials and can therefore not be recommended.

Late Dripping — Records started in February 1959 show a low percentage of late dripping for clones RRIM 623 and 628.

Brown Bast — The number of dry trees at the end of the third year of tapping is given in Table 4. The highest number is five, for clones RRIM 619 and 628.

Dry Rubber Content — Latex samples were analysed by Chemical Division in August 1959. Clone RRIM 621 had the lowest d.r.c. (26.1%) and clone RRIM 623 the highest (37.9%).

ESTATE TRIALS

Results of two years of tapping in a number of Estate trials are now available. A review of these will be published in a later issue of the *Planters' Bulletin.*

Amendments to Planting Recommendations 1959-60

THE FOLLOWING AMENDMENTS are made to our planting recommendations 1959-60 (*Planters' Bulletin 40*), pending the publication of new planting recommendations in a year's time:

CLASS I — RRIM 501: Owing to the widespread trunk snap which is being experienced, RRIM 501 can no longer be recommended for large scale planting without stringent qualifications. Planters who already have it or intend to use it should be prepared to wait until the trees reach a girth of twenty-five inches at sixty inches from the union before they commence tapping. Heavy manuring with sulphate of ammonia, particularly just after wintering, should be avoided. Pruning of the trees may become necessary but advice should be obtained from the R.R.I. before action is taken. Work is at present in progress on the problem of avoiding trunk snap and some preliminary results will be available before the end of 1960.

RRIM 513: We consider that RRIM 513 is a good substitute for RRIM 501 on all but the very poorest soils. Recent records indicate that it is more vigorous than it appeared to be from records taken from RRIM 500 series clones trials which were budded before the war and were neglected during the occupation.

CLASS II — No change.

CLASS III — RRIM 603 and RRIM 610 are not at present sufficiently outstanding to remain in the group of most promising 600 series clones. This does not mean that they have been discarded.

RRIM 628 continues to yield very highly and is included in the most promising group which now consists of RRIM 600, 605, 606, 607, 623 and 628.

Clone PB T 207 has been discarded because of susceptibility to wind-damage, as already announced in *Planters' Bulletin 45*, page 148.

Clitoria Rubiginosa

THIS LEGUMINOUS CREEPER was first found in Malaya by Mr G.C. McCulloch of Chamek Estate. It is of South American origin and has now spread to Africa and parts of Asia. Although it has been under observation for a few years, it is too early to say whether it is an advance on other cover crop species. Nevertheless the characteristics described below indicate that it is well worth a trial.

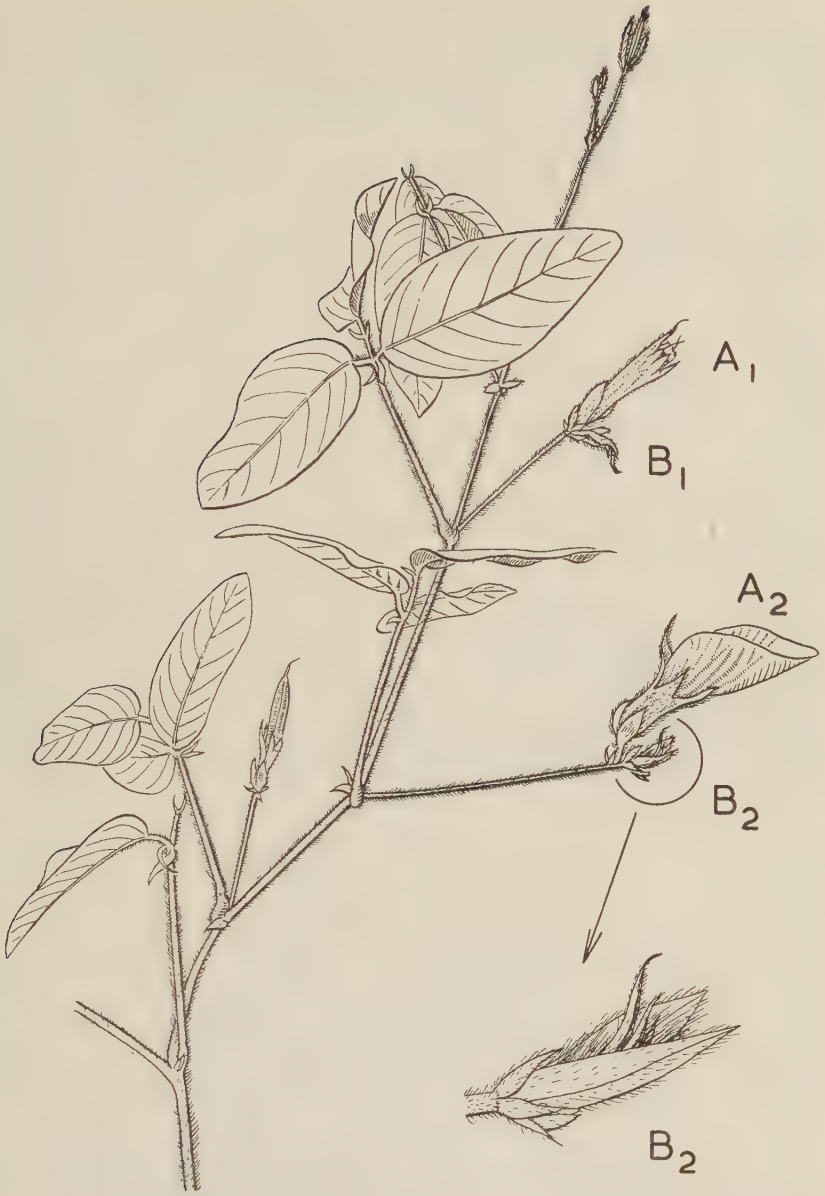
Clitoria rubiginosa thrives on a variety of soils including poor sand, and returns a fair quantity of leaf litter to the soil. Although this soft leafed creeper has nodulated without special inoculation on several sites, our Pathological Division has isolated a strain of *Rhizobium* in case of need. The creeping stems of *C. rubiginosa* do not root strongly at the nodes, with the result that the cover can be folded back from the planting rows without difficulty. It climbs by twining and fits in well with a mixture of shrubs, but it should not be allowed to invade the planting rows and climb the trees.

It has survived and spread despite competition from *Mikania* and grasses, although it has not choked such unwanted growths completely. It dies back during severe drought but regenerates well afterwards. It does not seem possible to establish or to maintain *C. rubiginosa* in deep shade, but its shade tolerance appears to be better than that of the commonly used creeping legumes. Preliminary results indicate that it will stand periodic cuts to provide mulch or fodder, but these should not be too frequent.

Occasionally flowers with purple-streaked white petals are observed, but in the climate of Malaya small self-fertilised flowers without petals are more common (see illustration). *C. rubiginosa* sets a fair quantity of seed in Malaya. The seed is sticky, but handling at sowing time may be facilitated by dusting the seed with ground rock phosphate which also aids establishment. The usual phosphate dressings for legumes should be given later.

There is no commercial source of supply of *C. rubiginosa* seed. As far as our stocks permit, we will send a quarter of a pound of seed to any estate manager or interested party in Malaya who may wish to establish this plant for further multiplication and observation. A

Clitoria rubiginosa



A_1. *Petalled flower in the bud stage.*

A_2. *Petalled flower, open. Note that the flower stalk is twisted so that the standard petal is below and the longest sepal is above, as is typical of* Clitoria *species.*

B_1 and B_2. *Flowers without petals, more commonly found than petalled ones. The long sepal is below the flower in* B_1 *and above it in* B_2. *Examples of both are common.*

nominal cost of collection and despatch will be charged. If we await full confirmation of the value of this legume before multiplication of material, its potential use on a large scale will be delayed.

We prefer to use the Latin botanical names for plants, but we realise that it is often convenient to have a common name, especially as other species of *Clitoria* have been introduced into Malaya which might cause confusion. Therefore we suggest the name 'Chamek creeper', and Malay or Tamil equivalents, in honour of Mr McCulloch's discovery of *C. rubiginosa* on Chamek Estate.

Low Ammonia Latices: The Use of Boric Acid

WE HAVE BEEN MUCH CONCERNED in recent years in investigating alternatives to ammonia for preserving latex concentrate which continues to be one of our most valuable rubber exports. Many different chemicals have been tested which might have been expected to preserve latex, because of their bactericidal action or their ability to 'neutralise' destabilising substances, but only a few have survived the searching laboratory tests applied to natural rubber latices destined for commercial application. We may fairly claim that all the present commercial low ammonia latices produced in Malaya were born in our laboratories. Others are under investigation and perhaps among them there may be a preservative system which is clearly superior to all others.

TYPES OF LOW-AMMONIA PRESERVATION OF LATEX IN MALAYA

Five different kinds of low ammonia latex concentrate are at present being made in commercial quantities in Malaya. They are described below:

1. Santobrite latex was first patented in 1938 by the Monsanto Chemical Company from work done at R.R.I.M. and by agreement with the company the Institute issued free licences to producers who wished to make use of the process : it is no longer necessary to obtain a licence and this type of latex is now being made by most Malayan producers of concentrate. Sodium pentachlorphenate (Santobrite), or pentachlorphenol (Santophene) dissolved in caustic soda, at concentrations ranging between 0.1 and 0.3%, is used together with 0.2 to 0.1% ammonia.

2. EDTA (ethylenediamine tetracetic acid) latex was the subject of a patent by the U.S. Rubber Company. The acid is used commercially at a concentration of 0.2% together with 0.2% ammonia.

3. A patent for the use of combinations of EDTA with Santobrite

and ammonia has been granted to the R.R.I.M. and such combinations are in commercial use.

4. The General Latex Corporation has patented the use of zinc dialkyl dithiocarbamates, together with a soap, for latex preservation. The H. & C. Latex Company make a low ammonia latex based on this system using up to 0.1% of ZDC and about 0.2% ammonia.

5. Boric acid preserved latex is the subject of a patent application (already granted in certain countries) by the R.R.I.M. and licences to produce this type of concentrate are granted free of charge to Malayan producers. The terms of the licence require that regular returns of the amount produced be made to the R.R.I.M. and that samples of shipments be submitted for testing to provide for quality control. It was found that 0.2 to 0.25% boric acid, 0.2% ammonia and about 0.05% ammonium laurate soap are required to give adequate preservation and satisfactory mechanical stability.

PRESERVATION OF LATEX WITH BORIC ACID

Method of Employment

Several methods of adding boric acid have been tried. Boric acid is not very soluble in water, but it is more soluble in hot water and in the form of ammonium borate. It may be added in three ways:

1. A solution of boric acid in dilute ammonia water is drip fed into the concentrate as it leaves the centrifuge, the quantity of solution being sufficient to give the desired boric acid concentration in the finished concentrate.

2. A masterbatch of concentrate containing some 10% of boric acid is made up and added in the correct proportion to concentrate leaving the centrifuge.

3. The field latex may be preserved with a little ammonia and sufficient boric acid to give the correct boric acid content in the concentrate. After centrifuging, the ammonia content is corrected.

The addition of boric acid reduces the mechanical stability of low ammonia preserved concentrate but this reduction is corrected by adding a small amount of ammonium laurate. The amount required varies according to the source of latex, but rarely exceeds 0.05%.

Characteristics of the Preserved Latex

Although in many cases the viable bacteria count is relatively high, bacteria can readily be eliminated by the addition of very small amounts (0.02%) of other bactericides such as Santobrite and methyl selenac. The KOH number of boric acid preserved latices rises slowly on storage, as in other preserved latices, but the V.F.A. number is usually very low.

The KOH number of a boric acid preserved latex appears to be high. This is because the method of measurement does not distinguish

between the boric acid and the acids normally contained in the latex. An allowance must be made for the boric acid amounting to 0.14 KOH number for every 0.1% by weight of the acid. Thus if the measured KOH number of a boric acid latex containing 0.22% boric acid is 0.75 it will be equivalent to a true KOH number of $0.75 - (2.2 \times 0.14) = 0.44$.

Costs

Boric acid, especially the technical grade, is cheaper than ammonia but the cost of the soap required partly offsets this saving. When boric acid is added to the concentrate it is necessary to produce initially a concentrate of slightly higher d.r.c. to accommodate the dilution caused by the addition of the boric acid solution. This results in a slightly lower efficiency. The overall cost of production of boric acid preserved latex is about the same as that of normal ammoniated latex.

Advantages of the Process

The first step in most latex users' processes which are based on standard types of ammonia preserved concentrate is to reduce the ammonia content of the latex from 0.7% to 0.2%. This de-ammoniation is rendered unnecessary by the use of boric acid preserved latex or other low ammonia latices. Boric acid is not poisonous, has no dermatitic action and is easier to handle than ammonia. Rubber films prepared from boric acid preserved latex are lighter in colour than those from other latices.

Quality of the Latex

Boric acid preserved latex is a good low ammonia latex. In many cases it can be substituted directly for fully ammoniated latex concentrate without modification of the users' procedure. In other cases some alteration is needed before the changeover can be effected. Criticisms of boric acid latex have included the following:

1. On prolonged storage some deterioration occurred in certain cases. This is believed to have been due to bacterial growth which can be stopped by the addition of small amounts of bactericides.

2. It has a lower chemical stability and thickening can occur on extended storage after compounding.

3. The presence of borates reduces the speed of vulcanisation of latex compounds and, if no adjustment is made for this, foam rubber prepared from boric acid latex may have a lower hardness.

4. It has been alleged that unvulcanised films prepared from boric acid latices have poor ageing properties but we have not been able to substantiate this statement.

These defects can be corrected by suitable modification of the compounding formulation and for most applications the advantages outweigh the defects as may be seen from the figures which follow.

World Consumption

The commercial production of boric acid preserved latex began in 1957. In a little over two years 1,629,858 Imperial gallons of this latex containing 4,150 long tons dry rubber have been shipped from Malaya. These shipments comprised:

Year	*Gallons*
1956	2,565
1957	344,178
1958	606,917
1959 (first 6 months)	676,238

Shipments have been made both in drums and in bulk by seven Malayan producers of latex concentrate to fifteen countries situated as follows:

Destination	*% of total*
Europe, excluding Great Britain	49.8
Great Britain	26.3
The American continent	21.1
Australasia, including Pacific Asia	2.8
Africa	0.01

It is evident that boric acid preserved latex has found commercial acceptance, particularly in Europe, and that its production is already an important contribution to the quantity of low ammonia latex produced. We expect that low ammonia latices will form an increasingly large proportion of total latex concentrate production. It remains to be seen whether any one of those presently produced will become dominant or whether similar preservative systems, still on the research bench, will eventually prove superior.

Damage by a Bamboo Rat

We have occasionally heard reference to 'beaver-damage' in Malayan rubber plantings. As beavers are confined to the colder parts of Europe and North America, the damage was assumed to have been the work of some indigenous rodent. Porcupines, which are known to be able to sever young plants with one bite, were particularly suspected.

Recently, specimens have been received from an estate in Johore showing just the sort of damage which might be expected from beavers. Several $2\frac{1}{2}$-year-old clonal seedlings have been felled by an animal gnawing away at the collar, just below ground level. The top of the tap root was hollowed out, and the wood bore regular tooth marks. The animal responsible was apparently living in a burrow made in an abandoned termite nest.

The Manager of the estate solved the mystery of the identity of the culprit by catching it. Its large body, short tail, large orange incisors and yellowish

body colour marked it as the 'yellow-cheeked bamboo rat', *Rhizomys sumatrensis* (see photograph on front cover). It is discribed on page 24 of Volume 4 (1949) of the *Malayan Nature Journal*. The specimen fed on sweet potatoes and was exhibited at the M.A.H.A. zoo.

Similar damage, shown in the above photograph, was reported about the same time on 2-year-old seedlings on a group of smallholdings in Negri Sembilan. A skull in a burrow was identified by the Chief Game Warden as that of a bamboo rat. The extent of the burrows in this area made control measures difficult.

Because the flesh is reputed to be good eating, the local people may be encouraged to catch the animals. If their burrows are excavated they can be caught in bags as they attempt to escape.

Journal

The *Journal of the Rubber Research Institute of Malaya*, Volume 16, Part 1, contains two papers which are described below:

H. M. Burkill. *Large Scale Variety Trials* of Hevea brasiliensis *Muell-Arg. on Malayan Estates 1934-53*. Communication 324.

Mr Burkill was formerly at the Rubber Research Institute of Malaya and is now Director of the Botanic Gardens, Singapore. His paper reports on our trials, planted before the war, in which old Malayan and Javan clones, the RRIM 500 series clones and clonal seedlings obtained from seed gardens in Malaya were tested for yield and secondary characteristics.

The war interfered badly: records of early growth were lost, thinning was done too late and upkeep and manuring were neglected. The growth of the trees in general was retarded, but owing to delay in opening the trees for tapping a satisfactory girth had been obtained when the trees were tapped. In these experiments seedlings generally showed greater vigour (as determined by girth measurements) than clones. Clonal seedlings were highly susceptible to brown bast.

The best of the 500 series clones yielded better than all other varieties tested. Special mention is made of clone RRIM 501 which proved outstanding in all experiments.*

* The sensitivity of clone RRIM 501 to trunk snap, now becoming increasingly apparent on estates in Malaya, was not observed in our experiments planted before the war — probably because the trees had attained a girth well in excess of 20 inches when they were opened for tapping after the war. The fact that most trees were planted on virgin soil which received no fertiliser treatment may also have contributed to the wind-fastness of clone RRIM 501 in these trials.

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R.S. GALE. *A Survey of Factors Involved in the Experimental Study of the Drying of Sheet Rubber.* Communication 325. This is the first of a series of papers recording the results of the more fundamental side of the Institute's programme of work on the drying of sheet rubber. It describes a series of exploratory investigations, undertaken as a preliminary to the main investigation of the effects of temperature and humidity on drying rates and rubber properties. The main items in the six sections of the paper are described below.

Dimensions

In the first section the factors affecting the dimensional changes during preparation and drying of sheet are considered. Alteration in the shape of a sheet during drying depends on the amount of water lost, its initial length and the intensity of machining used in its preparation. In experimental work on drying it is important to have sheets of uniform thickness, and suitable methods of preparing and hanging test sheets are described. The finding that the volume of a sheet decreases during drying by an amount equal to the volume of water lost shows that no voids are left in the interstices as the sheet dries out.

Drying Rates

The second section deals with the mechanisms of water loss during drying and in particular the effect of temperature and humidity on the drying rate. Temperature measurements confirm that in the initial stages of drying the surface is saturated with water and that the changes in drying conditions will influence the evaporation rate in much the same way as they influence evaporation from free water surfaces. The loss of water from the sheet is however influenced by spontaneous exudation of water which can exceed the rate of evaporation and cause water to drip from the sheet. The rate of exudation is influenced by the intensity of the stresses set up during machining and by the sheet temperature. In the later stages of drying, when diffusion within the sheet controls the drying rate, the effect of air humidity is unexpectedly large; an increase in humidity from 15% to 70% increases the drying time by a factor of 2.7.

Moisture Content

The third section reports data on the amount of water contained in sheet at equilibrium with various relative humidities. These variations in the water content of the sheet are almost certainly associated with the effect of humidity on drying rate.

Since the point at which a sheet becomes translucent is not an accurate criterion of dryness, a method of determining the dry weight of samples has been developed and is described in the fourth section of the paper. It consists of drying a sample over activated alumina having less than a specified minimum water content. It is shown that oven drying at high temperature is not a satisfactory method because of the loss of volatile material other than water.

Blisters

Increasing the temperature of drying leads to faster and more economic drying conditions but a limit is set by the appearance of blisters above a certain temperature. The investigations reported in the fifth section throw considerable light on the causes of blister formation and show that both decreasing thickness and

increasing relative humidity are effective in reducing this defect.

Technological Properties

In the last section the effect of drying conditions on the technological properties of the rubber are described. Drying at 200°F and 70% R.H. softens the raw rubber appreciably but the properties of such rubber when vulcanised are not inferior. The finding that the presence of water in the rubber accelerates softening is of importance from a fundamental point of view and it also suggests that drying at high humidities could lead to more rapid degradation than at low humidities.

Conclusion

In the conclusion it is shown how the investigations have led to a realisation of the most important factors in the drying of sheet and their potential influence on drier design. The humidity of the air is particularly important since it affects the rate of drying, blister formation and softening of the rubber.

Author's Comment

In work which has been carried out since the above investigations were completed, the magnitude of the effect of increased relative humidity in increasing drying times has been amply confirmed, and it is of interest to record here the way in which these results influence the consideration of improved designs of drier.

In a tunnel drier in which the air passes from one end to the other by forced draught, the temperature gradient down the length of the tunnel is less than in a smokehouse, particularly when the walls are well insulated to conserve heat (see *Planters' Bulletin 41*, March 1959, page 43). To prevent the sheet becoming overheated at the cool end the hot-end temperature must be held down below the maximum which the sheet will stand when almost dry. Alternatively, if the temperature is maintained at a higher level at the hot end then a much higher humidity must be used in order to reduce the tendency for blister formation at the cool end. It is partly for this reason that a 'sweating' period is used in some commercial driers. The disadvantage of this is that during this period of very high humidity the drying of the whole charge of rubber is retarded with consequent loss of output.

Although the single-stage drier has the virtue of simplicity of design and is a reasonable compromise, it appears that there are potential advantages to be gained by drying the rubber in two stages, each with its appropriate optimum drying conditions. In the first stage the bulk of the water would be removed and the sheet conditioned at high humidity. The second stage would correspond with the phase of slower drying at a relatively low optimum humidity.

It remains to be determined whether the extra cost of plant would be justified by the increased output and flexibility obtained.

R. R. I. News

Mr D.R. Westgarth, M.Sc., who was formerly the Institute's Statistician, rejoined the staff in November after an interval of two years. During his absence from Malaya he has been engaged in industrial operational research in Canada and in statistical work for the Medical Research Council at the Atomic Energy Research Establishment at Harwell, England. He resumes duty as Head of the Statistics Section.

Courses for Senior Estate Conductors

Refresher courses for senior estate conductors are offered this year at the R.R.I. Experiment Station during 25 April to 29 April, 16 May to 20 May, 13 June to 17 June and 4 July to 8 July. Twelve conductors can be taken on each course; they must be senior experienced men who are actually in employment, and all applications must be made by the managers of the estates concerned.

The programme will be mainly field work. Demonstrations, talks and lectures will include replanting and new planting procedures, weed control, establishment of legume covers, budgrafting and care of young budgrafts, pests and disease treatments, manuring, tapping systems, yield stimulation and a brief outline of factory procedure.

Please apply early, to the Director.

Cancellation of Restrictions on Clones RRIM 600—630

As from 31st December 1959, the Board of the Rubber Research Institute of Malaya have removed all restrictions on the sale of the clones RRIM 600 – 630 in Malaya, British North Borneo, Sarawak and Brunei.

All agreements relating to budwood of these clones were cancelled on that date and producers are now free to purchase or sell the budwood within the territories noted above.

Readers are asked to note that the release of these clones does not imply any change in our planting recommendations in which we state that 'promising clones' of this series should not be used except for planting on an experimental scale.

OUR COVER SHOWS A PEST OF RUBBER SEEDLINGS, THE BAMBOO RAT. SEE NOTE IN THIS ISSUE.

The Standard Engravers & Art Printers, 63 Campbell Road, Kuala Lumpur, Selangor